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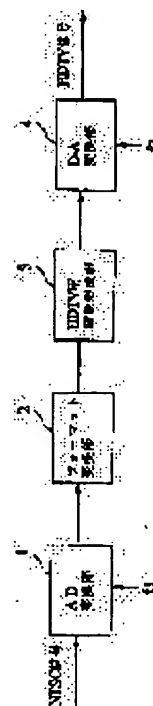
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(54) NTSC/HDTV SYSTEM CONVERSION METHOD

(57)Abstract:

PURPOSE: To simplify the conversion processing by doubling number of scanning lines of odd or even fields of a signal resulting from applying ADD-conversion to an NTSC signal so as to generate 1st and 2nd fields for HDTV and adding a prescribed area for aspect ratio correction around a converted signal.

CONSTITUTION: An NTSC signal is subjected to A/D-conversion by an A/D converter section 1 and a format conversion section 2 doubles number of scanning lines of odd and even fields (Fi) to generate 1st and 2nd fields for HDTV. That is, the conversion section 2 generates two HDTV fields from one NTSC field to correct a deviation due to difference from the field frequencies thereby converting simultaneously number of scanning lines and the field frequency. Moreover, an HDTV image forming section 3 provides a prescribed color/ decoloring area of a prescribed width around a valid area picture after conversion to insert each field to a center of the HDTV pattern. Then a D/A converter section 4 applies D/A-conversion to the processed signal by a frequency f2 to output an HDTV signal. Thus, the conversion processing is simplified.



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CLAIMS

[Claim(s)]

[Claim 1] While changing an NTSC signal into a digital signal, doubling the number of scanning lines by subsequently creating the new scanning line based on the scanning line of the ** field which consists of the digital signal, or the ** field and forming the 1st field for HDTV, or the 2nd field Both the fields for Above HDTV are formed from one field of the ***** field or the ** field to predetermined timing. Subsequently, the NTSC/HDTV method conversion method which adds a predetermined field to the 1st for Above HDTV, and the circumference of the 2nd field, amends to the aspect ratio of HDTV, and was changed subsequently to an analog signal.

[Claim 2] Change an NTSC signal into a digital signal and, subsequently the horizontal number of pixels of the ** field which consists of the digital signal, or the ** field is changed predetermined twice. While doubling the number of scanning lines and forming the 1st field for HDTV, or the 2nd field by creating the new scanning line based on the scanning line of the ** field after the aforementioned number conversion of horizontal pixels, or the ** field Both the fields for Above HDTV are formed from one field of the ***** field or the ** field to predetermined timing. Subsequently, the NTSC/HDTV method conversion method which adds a predetermined field to the 1st for Above HDTV, and the circumference of the 2nd field, amends to the aspect ratio of HDTV, and was changed subsequently to an analog signal.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the NTSC / the HDTV method conversion method for enabling the output of the image information picturized by the NTSC color TV system which is the present television to the monitor of a high quality TV (HDTV) method.

[0002]

Background of the Invention] As everyone knows, the number of scanning lines of the present television is 525, and, in field frequency, 59.94Hz of aspect ratios has become 4:3 further. On the other hand, the number of scanning lines of a high quality TV is 1125, and, in field frequency, 60Hz of aspect ratios has become 16:9 further. Thus, since the methods (format) differ, both cannot display the image information picturized by the present NTSC color TV system as it is on the monitor of a high quality TV. Therefore, it is necessary to perform predetermined conversion, to make other methods suit to the image data picturized by one method, and to make it display.

[0003] by the way, high energy with much information stored in the field of one sheet -- the method transformed into an NTSC color TV system from a dense HDTV method, although a large number are developed from the former The conversion method of the opposite direction which is the field of the invention of the invention in this application In order to create high-density image information from the image information of low density, it is seldom developed but, moreover, that the conventional proposal is made changes an aspect ratio. subsequently While correcting a difference of the above-mentioned format in order as the scanning line is changed and field frequency is changed after that, it is made for processing at each process to correct the above-mentioned difference nearly completely. Therefore, by this conventional method, there are many place science-and-engineering constants, and since it is made to correct all differences of a format, processing in each processing section is complicated, and it takes time. Therefore, transform processing needs together with the problem of the above-mentioned number of down stream processing for a long time, and transform processing in real time is difficult. . .

[0004] The place which this invention was made in view of the above-mentioned background, and is made into the purpose has simple transform processing, and transform processing in real time offers the easy NTSC/HDTV method conversion method.

[0005]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, by the NTSC/HDTV method conversion method concerning this invention While changing an NTSC signal into a digital signal, doubling the number of scanning lines by subsequently creating the new scanning line based on the scanning line of the ** field which consists of the digital signal, or the ** field and forming the 1st field for HDTV, or the 2nd field Both the fields for Above HDTV are formed from one field of the ***** field or the ** field to predetermined timing. Subsequently, a predetermined field is added to the 1st for Above HDTV, and the circumference of the 2nd field, and it corrects to the aspect ratio of HDTV, and was made to change subsequently to an analog signal.

[0006] Moreover, change an NTSC signal into a digital signal and, subsequently the horizontal number

of pixels of the ** field which consists of the digital signal, or the ** field is changed predetermined twice. While doubling the number of scanning lines and forming the 1st field for HDTV, or the 2nd field by creating the new scanning line based on the scanning line of the ** field after the aforementioned number conversion of horizontal pixels, or the ** field Both the fields for Above HDTV are formed from one field of the ***** field or the ** field to predetermined timing. Subsequently, a predetermined field is added to the 1st for Above HDTV, and the circumference of the 2nd field, it corrects to the aspect ratio of HDTV, and you may make it change subsequently to an analog signal. [0007]

[Function] It digitizes first to an NTSC signal, and subsequently, after carrying out the predetermined multiple (1 time, i.e., the thing which is not fluctuated, is included) of the horizontal number of pixels (width of face) from the changed digital signal (** field, ** field) if needed, conversion which doubles the number of scanning lines is performed, and the 1st field for HDTV or the 2nd field is created. And although the field of one sheet for HDTV is created from the field of one sheet of NTSC in principle, based on the one ** field or the ** field, the two fields (the 1st, the 2nd field) of HDTV are created to predetermined timing. That is, the gap by the difference of field frequency is amended by creating the field of HDTV of two sheets from the field of NTSC of one sheet. This performs simultaneously conversion of the number of scanning lines, and conversion of field frequency by performing this format conversion. Subsequently, if starting transform processing is completed, the field of predetermined width of face will be established in the circumference of the picture after conversion (effective field), and fitting processing to a HDTV screen (it consists of an aspect ratio of 16:9) will be performed. Then, it analog-izes in the sampling frequency of a predetermined number, and a HDTV signal is created. [0008]

[Example] Hereafter, about the suitable example of the NTSC / the HDTV method conversion method concerning this invention, an accompanying drawing is made reference and explained in full detail. Drawing 1 shows the equipment for carrying out the 1st example of this invention. Although the aspect ratio (4:3) of NTSC differs from it (16:9) of HDTV, it is made to display into the monitor of HDTV in this invention with the aspect ratio of 4:3. And as concrete composition is shown in this drawing, an NTSC signal (analog) is sent to the A-D transducer 1, and is changed into a digital signal using a sampling frequency ($f_1=13.5\text{MHz}$) in there. In addition, it is separated into a total of three signals of a luminance signal and two chrominance signals by pretreatment, and this NTSC signal is hereafter processed in parallel to these three signals.

[0009] And the digital signal after conversion is sent to the format conversion section 2 of the next step, and conversion of the number of scanning lines and conversion of field frequency are simultaneously performed in there. If the basic principle of the conversion which starts first here is explained, although the 1st field for HDTV and the 2nd field will be created using the ** field or the ** field of an NTSC signal (refer to drawing 2), if its attention is paid to the difference of a format with NTSC and HDTV at this time, the number of scanning lines will have about 2 twice (in fact double-precision strength) as many NTSC as this, and it will depend for the horizontal number of pixels on a sampling frequency. Therefore, it is made to create the 1st field and the 2nd field for HDTV which consist of an aspect ratio of 4:3 in this example, without changing horizontal width of face, while making the number of scanning lines of the field of NTSC into double precision by choosing the sampling frequency of HDTV appropriately. Thereby, simple conversion is attained.

[0010] On the other hand, in NTSC, since field frequency also differs from 60Hz in HDTV, if it creates the 1st field of HDTV from the ** field of NTSC simply and the 2nd field of HDTV is created from the ** field of NTSC by 59.94Hz, a gap will produce it in the direction of a time-axis (the amount of gaps also becomes large gradually). Then, although the 1st field is created from the ** field and the 2nd field is created from the ** field at the beginning as shown in drawing 3, if it comes at predetermined time, the field, the 1st field and the 2nd field, of two sheets will be created from the ** field of one sheet, or the ** field. By this creation, since the correspondence relation of the field by the side of NTSC and HDTV is reversed, the 1st field is henceforth created from the ** field, and the 2nd field is created from the ** field. And although an illustration abbreviation is carried out, if it comes like the above at

predetermined time, the 1st field and the 2nd field (field of two sheets) will be created from the ** field of one sheet, or the ** field, and the correspondence relation of each field returns. With, according to the correspondence relation of the account of Gokami, the field for HDTV is created one by one. Thereby, the amendment (conversion) work of a difference of field frequency can be done easily.

[0011] Therefore, as shown in above-mentioned drawing 2, there is a mode of four conversion of the mode (**) changed into the 1st field and the mode (**) changed into the 2nd field from the ** field from the mode (**) changed into the 2nd field from the mode (**) changed into the 1st field from the ** field, and the ** field, and the ** field, and it is chosen suitably and performed.

[0012] Next, the concrete method of each four above-mentioned conversion is explained. In order to create the 1st field from the ** field first (conversion) Since the 1st field for HDTV will be created if the scanning line is newly added in the middle of each scanning line which adjoins the upper and lower sides in the ** field in addition to the scanning line which the ** field has as shown in drawing 4, The pixel from which the part whose position of the scanning line corresponds constitutes the scanning line of the mid-position, using the pixel on each scanning line of the ** field as it is is created by asking for the average of both the pixels of the scanning line of the upper and lower sides of corresponding NTSC, i.e., the sum of a value which multiplied each pixel by 0.5. Thereby, the 1st field of the HDTV with the same number of pixels with the number of scanning lines horizontal at twice is changed and created on the basis of the ** field of NTSC.

[0013] Moreover, in creating the 2nd field from the ** field, as shown in drawing 5, there is no scanning line of the ** field corresponding to the position (coincidence) of each scanning line which constitutes the 2nd field, and it locates the scanning line of the 2nd field in the part of the distance ratio of 1:3 (3:1) between the scanning lines which adjoin the upper and lower sides of the ** field.

Therefore, each pixel which constitutes the scanning line of the 2nd field is created by asking for both sum, after hanging 0.75 on the nearer one among each pixel of the scanning line of the upper and lower sides in the corresponding ** field and hanging 0.25 on the distant one.

[0014] Furthermore, in changing and creating the 1st and the 2nd field from the ** field, the same principle as the case from the ***** field performs. That is, since there is a part whose position of the scanning line corresponds among both the fields in creating the 1st field, as it is shown in drawing 6, the pixel which constitutes the scanning line in the ** field which is in agreement with the position of the scanning line of the 1st field is used as it is, and when there is no scanning line in agreement, it creates the new scanning line from the average of the pixel of the scanning line of the upper and lower sides to which it corresponds in the ** field. Moreover, since there is no part whose position of the scanning line corresponds with the original ** field in creating the 2nd field, after hanging 0.75 or 0.25 from the ***** field the same with having created the 2nd field to the pixel of the scanning line which adjoins the upper and lower sides in the ** field, the new scanning line is created by asking for those sums (refer to drawing 7).

[0015] And by processing either of the conversion methods showing the ** field or the ** field of NTSC in drawing 4 - drawing 7 according to the timing chart shown in drawing 3 as described above, the 1st field of desired HDTV or the 2nd field is created, and they are sent to the image formation section 3 for HDTV of the next step one by one. And since the image data for HDTV changed in the above-mentioned format conversion section 2 is 4:3 (the number of effective field pixels 720x480), if it remains as it is, it does not suit and it cannot display the aspect ratio on the aspect ratio (16:9 (the total number of pixels 1200x562.5)) of HDTV. Then, the background field BG of the 1st created in this image formation section 3 for HDTV and the predetermined colors (for example, blue etc.) which become the circumference of the 2nd field from predetermined width of face is formed, and each field by which creation was carried out [above-mentioned] performs fitting processing of a picture so that it may be located in the core of the actual field of HDTV which can be displayed (processing of ** in drawing 2, or **).

[0016] And if the starting fitting processing (each field in a HDTV digital method (aspect ratio 16:9)) is completed, the processed data are sent to the D/A conversion section 4, and in there, by the sampling frequency ($f_2=40.5\text{MHz}$), it will change into an analog and will output as a HDTV signal.

[0017] That is, by the conversion method in this example, according to the block diagram shown in drawing 1 , it processes in order and digitizes first to an NTSC signal (the luminance signal and the chrominance signal are separated) (refer to drawing 8).

[0018] Subsequently, from the changed digital signal (** field, ** field), the horizontal number of pixels (width of face) performs conversion which doubles the number of scanning lines, without making it fluctuate, and creates the 1st field for HDTV, or the 2nd field. And the inside of the scanning line which constitutes the field of HDTV in order to double the number of scanning lines, The pixel which constitutes the original scanning line about the position and match of the scanning line which constitute the field of NTSC of a changing agency is used as it is. When there is no scanning line which is in agreement all over the field of a changing agency, the new scanning line is created by [which is predetermined / which hung the scale factor (the sum of both scale factors is 1)] back-adding to each pixel which constitutes the two scanning lines located up and down.

[0019] Moreover, in this example, the two fields (the 1st, the 2nd field) of HDTV are created based on the one ** field or the ** field to predetermined timing. That is, the gap by the difference of field frequency is amended by creating the field of HDTV of two sheets from the field of NTSC of one sheet.

[0020] This will perform simultaneously conversion of the number of scanning lines, and conversion of field frequency by performing this format conversion. In addition, an aspect ratio is considered as as [of NTSC (4:3)] in order to suppress that the aspect ratio of each body displayed into the original image data changes, and the impression of appearance changes.

[0021] Subsequently, if starting transform processing is completed, that an aspectual ratio should be canceled, the background field (it colors in a predetermined color) of predetermined width of face will be established in the circumference of the picture after the above-mentioned conversion (effective field), and fitting processing located in the core of the HDTV screen where each of that field consists of an aspect ratio of 16:9 will be performed. Then, it analog-izes in 40.5MHz of sampling frequencies of a predetermined number, and a HDTV signal is created.

[0022] Thus, an NTSC signal is convertible for a HDTs signal. And in this example, while the number of processing is also simple few and being able to perform simultaneously transform processing of the scanning line, and conversion of field frequency moreover, the former transform processing accumulates and is easy only by doubling the number of scanning lines, and it becomes early easy to change [of real time] processing speed. Furthermore, the identity of the aspect ratio before and behind conversion can be secured, without writing the sampling frequency of HDTV to 40.5MHz, and the ratio of the horizontal number of pixels in the field of NTSC and HDTV becoming the same, and changing the horizontal number of pixels especially.

[0023] Drawing 9 and 10 show the 2nd example of this invention. It is for applying to the thing of the type with which it compares with the 1st above-mentioned example in this example, and the sampling frequencies of HDTV differ ($f_2=47.5\text{MHz}$). That is, when it changes by the method shown in the 1st example described above as it was using the starting sampling frequency (47.5MHz), horizontal ratios differ and an aspect ratio differs from the image data of a changing agency. Then, as shown in drawing 9 (A), number transducer of horizontal pixels 5' is prepared, and the lateral number of pixels is changed into a predetermined number in here. And in this example, it extends 7/6 time. Moreover, specifically, it carries out using the digital filter of 35 taps, and the filter factor is shown in the following table.

[0024]

[Table 1] $1/256 \times ()$ 10, 11, 12, 10, 3, -8, -23, -36, -44, -40, -22, 13, 62, 122, 183, 235, 268, 280, 268, 235, 183, 122, 62 and 13, -22, -40, -44, -36, -23, -8, 3, 10, 12, 11, 10) Therefore, as shown in this drawing (B), after digitizing the given NTSC signal in this example, The horizontal number of pixels is changed predetermined twice (7/6 time) (** in drawing 10 , **), and the ** field is created to the ** field list of the NTSC color TV system which consists of 840x240 (the number of effective field pixels) as shown in drawing 10 .

[0025] Subsequently, format conversion (**-**) is performed like the 1st above-mentioned example, and conversion of the number of scanning lines and field frequency is performed. Thereby, as shown in drawing 10 , the 1st field for HDTV or the 2nd field which consists of 840x480 (the number of effective

field pixels) is created, and the picture for displaying on the screen for HDTV which consists of an aspect ratio of 16:9 is created by using the fitting processing further for HDTV (**, **).

[0026] Then, analog-ization is attained in a predetermined sampling frequency ($f_2'=47.5\text{MHz}$), conversion to the signal for HDTV is performed, and the starting signal is outputted. And since the horizontal number of pixels was changed 7/6 time beforehand, the aspect ratio of the analog-ized HDTV signal becomes the same as the thing of the original NTSC signal. In addition, since other composition and operations are the same as that of the 1st above-mentioned example, detailed explanation is omitted. Moreover, the multiple in the number transducer of horizontal pixels is suitably set up according to a sampling frequency.

[0027] Next, an example of the example of use using the above-mentioned example is explained. In this example, it has applied to the system which performs the remote surveillance of supervising intensively polytopic points (a power generation facility, a power circulation facility, etc. which were formed in every place) in the management pin center, large which carried out remoteness using two or more HDTV cameras. When this system is explained, as shown in drawing 11, here Two or more HDTV cameras 10, The coding section 12 for carrying out coding transmission of the wide band signal acquired from the HDTV camera 10, The transmission control section 13 which performs various kinds of transmission control based on the instructions sent from the management pin center, large side, The selector 15 for changing the selector 14 for changing a picture signal, and the command signal of camera control, It has the synchronizing signal generator 16 which generates the synchronizing signal to two or more HDTV camera 10 --, and is constituted, and HDTV camera 10 -- connected [two or more] is changed alternatively.

[0028] While each HDTV camera 10 is connected with selectors 14 and 15 and the synchronizing signal generator 16 and a picture signal is outputted to a selector 14, the command signal of camera control, such as a posture of a camera and a focus, is fed from a selector 15, and a synchronizing signal is fed from a synchronizing signal generator 16.

[0029] The coding section 12 receives a picture signal from a selector 14, encodes this by multiplex sampling, and changes it into the transmission signal which narrowed and carried out the band compression of the signal bandwidth, and the transmission signal is sent out to a transmission line 17. A transmission line 17 is the communication network of 32Mbps(es) in this example, and this is constituted by the optical fiber.

[0030] The transmission control section 13 receives a control signal from a transmission line 17, various kinds of transmission control is performed based on this, and the command signal of camera control is outputted to a selector 15, and a change signal is sent out to selectors 14 and 15. A control signal is sent out from the management pin center, large which is not illustrated to a transmission line 17.

[0031] Selectors 14 and 15 perform a signal change according to the change signal sent from the transmission control section 13, a picture signal is changed in a selector 14, and the command signal of camera control is changed in a selector 15.

[0032] Thus, from a picture signal being changed by the selector 14 and the command signal of camera control being changed depending on a selector 15, HDTV camera 10 -- connected [two or more] is changed alternatively, and can be used, and a signal transmission can be performed between management pin center, large sides. That is, transmission equipment can perform rationally the remote surveillance of the polytopic point which could be managed with one set, consequently used two or more HDTV camera 10 -- to two or more HDTV camera 10 --.

[0033] by the way -- if it is original -- all surveillance areas -- high energy -- although it is desirable to install the HDTV camera 10 with which a dense picture is acquired, a highly precise thing is not required by the place -- others (the camera of an NTSC color TV system is also sufficient enough) -- NTSC camera 10' and the HDTV camera 10 may be intermingled for various reasons If the monitor of NTSC and the monitor of HDTV are formed by the management pin center, large side when starting, a monitor needs to look at two kinds of monitors, and the installation area and cost not only increase, but it will become complicated. Then, after changing into the image data for HDTV the data sent from NTSC camera 10' and the data sent from HDTV camera 10, the data sent from HDTV camera 10 is

concerning this invention, it is made to display them on a monitor 19. By making it this composition, it becomes possible to display and supervise the data picturized with the camera of a type which is different with the monitor of a single kind (monitor for HDTV).

[0034] Furthermore, although what emits an alarm etc. is developed in the starting managerial system when an automatic supervision is performed using an image processing and a man(invader)-like body exists all over a screen (a reference pattern, pattern matching, etc. which carried out human being's form perform) In this invention, since the aspect ratio conversion before and after conversion is displayed almost similarly, it can supervise correctly also from the data picturized by NTSC camera 10' also to the automatic supervision by this image processing.

[0035] In addition, the field of the invention of this invention of it not restricting to the above-mentioned monitoring system, and being able to apply to various things is natural.

[0036]

[Effect of the Invention] By the NTSC/HDTV method conversion method which starts this invention as mentioned above While facing changing and creating the field for HDTV from each field of an NTSC signal, being able to perform simultaneously transform processing accompanying the difference of the number of scanning lines, and the difference of field frequency and the contents of conversion doubling the number of scanning lines moreover Since the field for two sheets of HDTV is only created from the field of one sheet of NTSC to predetermined timing, the processing is simple, transform processing can carry out in a short time, and transform processing in real time of it becomes possible. And when transform processing (it doubles [predetermined]) of the number of level pixels is made to be performed before performing transform processing, such as the starting number of scanning lines, it becomes possible to make almost the same the aspect ratio of the display image of a changing agency

and the back also as arbitrary in the case of field frequency (field frequency conversion) of HDTV

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TECHNICAL FIELD

[Industrial Application] this invention relates to the NTSC/HDTV method conversion method for enabling the output of the image information picturized by the NTSC color TV system which is the present television to the monitor of a high quality TV (HDTV) method.

[0002]

Background of the Invention] As everyone knows, the number of scanning lines of the present television is 525, and, in field frequency, 59.94Hz of aspect ratios has become 4:3 further. On the other hand, the number of scanning lines of a high quality TV is 1125, and, in field frequency, 60Hz of aspect ratios has become 16:9 further. Thus, since the methods (format) differ, both cannot display the image information picturized by the present NTSC color TV system as it is on the monitor of a high quality TV. Therefore, it is necessary to perform predetermined conversion, to make other methods suit to the image data picturized by one method, and to make it display.

[0003] by the way, high energy with much information stored in the field of one sheet -- the method transformed into an NTSC color TV system from a dense HDTV method Although a large number are developed from the former The conversion method of the opposite direction which is the field of the invention of the invention in this application In order to create high-density image information from the image information of low density, it is seldom developed but, moreover, that the conventional proposal is made changes an aspect ratio. subsequently While correcting a difference of the above-mentioned format in order as the scanning line is changed and field frequency is changed after that, it is made for processing at each process to correct the above-mentioned difference nearly completely. Therefore, by this conventional method, there are many place science-and-engineering constants, and since it is made to correct all differences of a format, processing in each processing section is complicated, and it takes time. Therefore, transform processing needs together with the problem of the above-mentioned number of down stream processing for a long time, and transform processing in real time is difficult. .

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EFFECT OF THE INVENTION

[Effect of the Invention] By the NTSC/HDTV method conversion method which starts this invention as mentioned above Since the field for two sheets of HDTV is only created from the field of one sheet of NTSC to predetermined timing while facing changing and creating the field for HDTV from each field of an NTSC signal, being able to perform simultaneously transform processing accompanying the difference of the number of scanning lines, and the difference of field frequency and the contents of conversion doubling the number of scanning lines moreover, the processing is simple, transform processing can carry out in a short time, and transform processing in real time of it becomes possible. And when transform processing (it doubles [predetermined]) of the number of level pixels is made to be performed before performing transform processing, such as the starting number of scanning lines, it becomes possible to make almost the same the aspect ratio of the display image of a changing agency and the back also as arbitrary in the sampling frequency (for it to use, in case it analog-izes) of HDTV.

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MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose, by the NTSC/HDTV method conversion method concerning this invention While changing an NTSC signal into a digital signal, doubling the number of scanning lines by subsequently creating the new scanning line based on the scanning line of the ** field which consists of the digital signal, or the ** field and forming the 1st field for HDTV, or the 2nd field Both the fields for Above HDTV are formed from one field of the ***** field or the ** field to predetermined timing. Subsequently, a predetermined field is added to the 1st for Above HDTV, and the circumference of the 2nd field, and it corrects to the aspect ratio of HDTV, and was made to change subsequently to an analog signal.

[0006] Moreover, change an NTSC signal into a digital signal and, subsequently the horizontal number of pixels of the ** field which consists of the digital signal, or the ** field is changed predetermined twice. While doubling the number of scanning lines and forming the 1st field for HDTV, or the 2nd field by creating the new scanning line based on the scanning line of the ** field after the aforementioned number conversion of horizontal pixels, or the ** field Both the fields for Above HDTV are formed from one field of the ***** field or the ** field to predetermined timing. Subsequently, a predetermined field is added to the 1st for Above HDTV, and the circumference of the 2nd field, it corrects to the aspect ratio of HDTV, and you may make it change subsequently to an analog signal.

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OPERATION

[Function] It digitizes first to an NTSC signal, and subsequently, after carrying out the predetermined multiple (1 time, i.e., the thing which is not fluctuated, is included) of the horizontal number of pixels (width of face) from the changed digital signal (** field, ** field) if needed, conversion which doubles the number of scanning lines is performed, and the 1st field for HDTV or the 2nd field is created. And although the field of one sheet for HDTV is created from the field of one sheet of NTSC in principle, based on the one ** field or the ** field, the two fields (the 1st, the 2nd field) of HDTV are created to predetermined timing. That is, the gap by the difference of field frequency is amended by creating the field of HDTV of two sheets from the field of NTSC of one sheet. This performs simultaneously conversion of the number of scanning lines, and conversion of field frequency by performing this format conversion. Subsequently, if starting transform processing is completed, the field of predetermined width of face will be established in the circumference of the picture after conversion (effective field), and fitting processing to a HDTV screen (it consists of an aspect ratio of 16:9) will be performed. Then, it analog-izes in the sampling frequency of a predetermined number, and a HDTV signal is created.

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EXAMPLE

[Example] Hereafter, about the suitable example of the NTSC / the HDTV method conversion method concerning this invention, an accompanying drawing is made reference and explained in full detail.

Drawing 1 shows the equipment for carrying out the 1st example of this invention. Although the aspect ratio (4:3) of NTSC differs from it (16:9) of HDTV, it is made to display into the monitor of HDTV in this invention with the aspect ratio of 4:3. And as concrete composition is shown in this drawing, an NTSC signal (analog) is sent to the A-D transducer 1, and is changed into a digital signal using a sampling frequency ($f_1=13.5\text{MHz}$) in there. In addition, it is separated into a total of three signals of a luminance signal and two chrominance signals by pretreatment, and this NTSC signal is hereafter processed in parallel to these three signals.

[0009] And the digital signal after conversion is sent to the format conversion section 2 of the next step, and conversion of the number of scanning lines and conversion of field frequency are simultaneously performed in there. If the basic principle of the conversion which starts first here is explained, although the 1st field for HDTV and the 2nd field will be created using the ** field or the ** field of an NTSC signal (refer to drawing 2), if its attention is paid to the difference of a format with NTSC and HDTV at this time, the number of scanning lines will have about 2 twice (in fact double-precision strength) as many NTSC as this, and it will depend for the horizontal number of pixels on a sampling frequency. Therefore, it is made to create the 1st field and the 2nd field for HDTV which consist of an aspect ratio of 4:3 in this example, without changing horizontal width of face, while making the number of scanning lines of the field of NTSC into double precision by choosing the sampling frequency of HDTV appropriately. Thereby, simple conversion is attained.

[0010] On the other hand, in NTSC, since field frequency also differs from 60Hz in HDTV, if it creates the 1st field of HDTV from the ** field of NTSC simply and the 2nd field of HDTV is created from the ** field of NTSC by 59.94Hz, a gap will produce it in the direction of a time-axis (the amount of gaps also becomes large gradually). Then, although the 1st field is created from the ** field and the 2nd field is created from the ** field at the beginning as shown in drawing 3, if it comes at a predetermined stage, the field, the 1st field and the 2nd field, of two sheets will be created from the ** field of one sheet, or the ** field. By this creation, since the correspondence relation of the field by the side of NTSC and HDTV is reversed, the 1st field is henceforth created from the ** field, and the 2nd field is created from the ** field. And although an illustration ellipsis is carried out, if it comes like the above at a predetermined stage, the 1st field and the 2nd field (field of two sheets) will be created from the ** field of one sheet, or the ** field, and the correspondence relation of each field returns. With, according to the correspondence relation of the account of Gokami, the field for HDTV is created one by one. Thereby the amendment (conversion) ...

create the 1st field from the ** field first (conversion) Since the 1st field for HDTV will be created if the scanning line is newly added in the middle of each scanning line which adjoins the upper and lower sides in the ** field in addition to the scanning line which the ** field has as shown in drawing 4 , The pixel from which the part whose position of the scanning line corresponds constitutes the scanning line of the mid-position, using the pixel on each scanning line of the ** field as it is is created by asking for the average of both the pixels of the scanning line of the upper and lower sides of corresponding NTSC, i.e., the sum of a value which multiplied each pixel by 0.5. Thereby, the 1st field of the HDTV with the same number of pixels with the number of scanning lines horizontal at twice is changed and created on the basis of the ** field of NTSC.

[0013] Moreover, in creating the 2nd field from the ** field, as shown in drawing 5 , there is no scanning line of the ** field corresponding to the position (coincidence) of each scanning line which constitutes the 2nd field, and it locates the scanning line of the 2nd field in the part of the distance ratio of 1:3 (3:1) between the scanning lines which adjoin the upper and lower sides of the ** field.

Therefore, each pixel which constitutes the scanning line of the 2nd field is created by asking for both sum, after hanging 0.75 on the nearer one among each pixel of the scanning line of the upper and lower sides in the corresponding ** field and hanging 0.25 on the distant one.

[0014] Furthermore, in changing and creating the 1st and the 2nd field from the ** field, the same principle as the case from the ***** field performs. That is, since there is a part whose position of the scanning line corresponds among both the fields in creating the 1st field, as it is shown in drawing 6 , the pixel which constitutes the scanning line in the ** field which is in agreement with the position of the scanning line of the 1st field is used as it is, and when there is no scanning line in agreement, it creates the new scanning line from the average of the pixel of the scanning line of the upper and lower sides to which it corresponds in the ** field. Moreover, since there is no part whose position of the scanning line corresponds with the original ** field in creating the 2nd field, after hanging 0.75 or 0.25 from the ***** field the same with having created the 2nd field to the pixel of the scanning line which adjoins the upper and lower sides in the ** field, the new scanning line is created by asking for those sums (refer to drawing 7).

[0015] And by processing either of the conversion methods showing the ** field or the ** field of NTSC in drawing 4 - drawing 7 according to the timing chart shown in drawing 3 as described above, the 1st field of desired HDTV or the 2nd field is created, and they are sent to the image formation section 3 for HDTV of the next step one by one. And since the image data for HDTV changed in the above-mentioned format conversion section 2 is 4:3 (the number of effective field pixels 720x480), if it remains as it is, it does not suit and it cannot display the aspect ratio on the aspect ratio (16:9 (the total number of pixels 1200x562.5)) of HDTV. Then, the background field BG of the 1st created in this image formation section 3 for HDTV and the predetermined colors (for example, blue etc.) which become the circumference of the 2nd field from predetermined width of face is formed, and each field by which creation was carried out [above-mentioned] performs fitting processing of a picture so that it may be located in the core of the actual field of HDTV which can be displayed (processing of ** in drawing 2 , or **).

[0016] And if the starting fitting processing (each field in a HDTV digital method (aspect ratio 16:9)) is completed, the processed data are sent to the D/A conversion section 4, and in there, by the sampling frequency ($f_2=40.5\text{MHz}$), it will change into an analog and will output as a HDTV signal.

[0017] That is, by the conversion method in this example, according to the block diagram shown in drawing 1 , it processes in order and digitizes first to an NTSC signal (the luminance signal and the chrominance signal are separated) (refer to drawing 8).

[0018] Subsequently, from the changed digital signal (** field, ** field), the horizontal number of pixels (width of face) performs conversion which doubles the number of scanning lines, without making it fluctuate, and creates the 1st field for HDTV, or the 2nd field. And the inside of the scanning line which

agreement all over the field of a changing agency, the new scanning line is created by [which is predetermined / which hung the scale factor (the sum of both scale factors is 1)] back-adding to each pixel which constitutes the two scanning lines located up and down.

[0019] Moreover, in this example, the two fields (the 1st, the 2nd field) of HDTV are created based on the one ** field or the ** field to predetermined timing. That is, the gap by the difference of field frequency is amended by creating the field of HDTV of two sheets from the field of NTSC of one sheet.

[0020] This will perform simultaneously conversion of the number of scanning lines, and conversion of field frequency by performing this format conversion. In addition, an aspect ratio is considered as as [of NTSC (4:3)] in order to suppress that the aspect ratio of each body displayed into the original image data changes, and the impression of appearance changes.

[0021] Subsequently, if starting transform processing is completed, that an aspectual ratio should be canceled, the background field (it colors in a predetermined color) of predetermined width of face will be established in the circumference of the picture after the above-mentioned conversion (effective field), and fitting processing located in the core of the HDTV screen where each of that field consists of an aspect ratio of 16:9 will be performed. Then, it analog-izes in 40.5MHz of sampling frequencies of a predetermined number, and a HDTV signal is created.

[0022] Thus, an NTSC signal is convertible for a HDTV signal. And in this example, while the number of processing is also simple few and being able to perform simultaneously transform processing of the scanning line, and conversion of field frequency moreover, the former transform processing accumulates and is easy only by doubling the number of scanning lines, and it becomes early easy to change [of real time] processing speed. Furthermore, the identity of the aspect ratio before and behind conversion can be secured, without writing the sampling frequency of HDTV to 40.5MHz, and the ratio of the horizontal number of pixels in the field of NTSC and HDTV becoming the same, and changing the horizontal number of pixels especially.

[0023] Drawing 9 and 10 show the 2nd example of this invention. It is for applying to the thing of the type with which it compares with the 1st above-mentioned example in this example, and the sampling frequencies of HDTV differ ($f_2'=47.5\text{MHz}$). That is, when it changes by the method shown in the 1st example described above as it was using the starting sampling frequency (47.5MHz), horizontal ratios differ and an aspect ratio differs from the image data of a changing agency. Then, as shown in drawing 9 (A), number transducer of horizontal pixels 5' is prepared, and the lateral number of pixels is changed into a predetermined number in here. And in this example, it extends 7/6 time. Moreover, specifically, it carries out using the digital filter of 35 taps, and the filter factor is shown in the following table.

[0024]

[Table 1] $1/256 \times ()$ 10, 11, 12, 10, 3, -8, -23, -36, -44, -40, -22, 13, 62, 122, 183, 235, 268, 280, 268, 235, 183, 122, 62 and 13, -22, -40, -44, -36, -23, -8, 3, 10, 12, 11, 10) Therefore, as shown in this drawing (B), after digitizing the given NTSC signal in this example, The horizontal number of pixels is changed predetermined twice (7/6 time) (** in drawing 10 , **), and the ** field is created to the ** field list of the NTSC color TV system which consists of 840x240 (the number of effective field pixels) as shown in drawing 10 .

[0025] Subsequently, format conversion (**-**) is performed like the 1st above-mentioned example, and conversion of the number of scanning lines and field frequency is performed. Thereby, as shown in drawing 10 , the 1st field for HDTV or the 2nd field which consists of 840x480 (the number of effective field pixels) is created, and the picture for displaying on the screen for HDTV which consists of an aspect ratio of 16:9 is created by using the fitting processing further for HDTV (**, **).

[0026] Then, analog-ization is attained in a predetermined sampling frequency ($f_2'=47.5\text{MHz}$), conversion to the signal for HDTV is performed, and the starting signal is outputted. And since the horizontal number of pixels was changed 7/6 time beforehand, the aspect ratio of the analog-ized HDTV signal becomes the same as the thing of the original NTSC signal. In addition, since other composition and operations are the same as that of the 1st above-mentioned example, detailed explanation is omitted. Moreover, the multiple in the number transducer of horizontal pixels is suitably set up according to a sampling frequency.

[0027] Next, an example of the example of use using the above-mentioned example is explained. In this example, it has applied to the system which performs the remote surveillance of supervising intensively polytopic points (a power generation facility, a power circulation facility, etc. which were formed in every place) in the management pin center, large which carried out remoteness using two or more HDTV cameras. When this system is explained, as shown in drawing 11, here Two or more HDTV cameras 10, The coding section 12 for carrying out coding transmission of the wide band signal acquired from the HDTV camera 10, The transmission control section 13 which performs various kinds of transmission control based on the instructions sent from the management pin center, large side, The selector 15 for changing the selector 14 for changing a picture signal, and the command signal of camera control, It has the synchronizing signal generator 16 which generates the synchronizing signal to two or more HDTV camera 10 --, and is constituted, and HDTV camera 10 -- connected [two or more] is changed alternatively.

[0028] While each HDTV camera 10 is connected with selectors 14 and 15 and the synchronizing signal generator 16 and a picture signal is outputted to a selector 14, the command signal of camera control, such as a posture of a camera and a focus, is fed from a selector 15, and a synchronizing signal is fed from a synchronizing signal generator 16.

[0029] The coding section 12 receives a picture signal from a selector 14, encodes this by multiplex sampling, and changes it into the transmission signal which narrowed and carried out the band compression of the signal bandwidth, and the transmission signal is sent out to a transmission line 17. A transmission line 17 is the communication network of 32Mbps(es) in this example, and this is constituted by the optical fiber.

[0030] The transmission control section 13 receives a control signal from a transmission line 17, various kinds of transmission control is performed based on this, and the command signal of camera control is outputted to a selector 15, and a change signal is sent out to selectors 14 and 15. A control signal is sent out from the management pin center, large which is not illustrated to a transmission line 17.

[0031] Selectors 14 and 15 perform a signal change according to the change signal sent from the transmission control section 13, a picture signal is changed in a selector 14, and the command signal of camera control is changed in a selector 15.

[0032] Thus, from a picture signal being changed by the selector 14 and the command signal of camera control being changed depending on a selector 15, HDTV camera 10 -- connected [two or more] is changed alternatively, and can be used, and a signal transmission can be performed between management pin center, large sides. That is, transmission equipment can perform rationally the remote surveillance of the polytopic point which could be managed with one set, consequently used two or more HDTV camera 10 -- to two or more HDTV camera 10 --.

[0033] by the way -- if it is original -- all surveillance areas -- high energy -- although it is desirable to install the HDTV camera 10 with which a dense picture is acquired, a highly precise thing is not required by the place -- others (the camera of an NTSC color TV system is also sufficient enough) -- NTSC camera 10' and the HDTV camera 10 may be intermingled for various reasons. If the monitor of NTSC and the monitor of HDTV are formed by the management pin center, large side when starting, a monitor needs to look at two kinds of monitors, and the installation area and cost not only increase, but it will become complicated. Then, after changing into the image data for HDTV the data sent from NTSC camera 10' through the NTSC/HDTV transducer 18 which performs the conversion method concerning this invention, it is made to display them on a monitor 19. By making it this composition, it becomes possible to display and supervise the data picturized with the camera of a type which is different with the monitor of a single kind (monitor for HDTV).

[0034] Furthermore, although what emits an alarm etc. is developed in the starting managerial system when an automatic supervision is performed using an image processing and a man(invader)-like body exists all over a screen (a reference pattern, pattern matching, etc. which carried out human being's form perform) In this invention, since the aspect ratio conversion before and after conversion is displayed almost similarly, it can supervise correctly also from the data picturized by NTSC camera 10' also to the automatic supervision by this image processing.

[0035] In addition, the field of the invention of this invention of it not restricting to the above-mentioned monitoring system, and being able to apply to various things is natural.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is a block block diagram for carrying out the 1st example of the NTSC/HDTV method conversion method concerning this invention.

[Drawing 2] It is drawing for explaining an operation.

[Drawing 3] It is drawing explaining an operation of transform processing of field frequency.

[Drawing 4] It is drawing explaining an operation of transform processing of the number of scanning lines.

[Drawing 5] It is drawing explaining an operation of transform processing of the number of scanning lines.

[Drawing 6] It is drawing explaining an operation of transform processing of the number of scanning lines.

[Drawing 7] It is drawing explaining an operation of transform processing of the number of scanning lines.

[Drawing 8] It is drawing showing the 1st example of the NTSC/HDTV method conversion method concerning this invention.

[Drawing 9] It is drawing showing the 2nd example of the NTSC/HDTV method conversion method concerning this invention.

[Drawing 10] It is drawing for explaining the operation.

[Drawing 11] It is drawing showing an example of the use mode of this invention.

[Description of Notations]

1 1' A-D transducer

2 2' Format conversion section

3 3' The image formation section for HDTV

4 4' D/A conversion section

5' The number transducer of horizontal pixels

[Translation done.]